

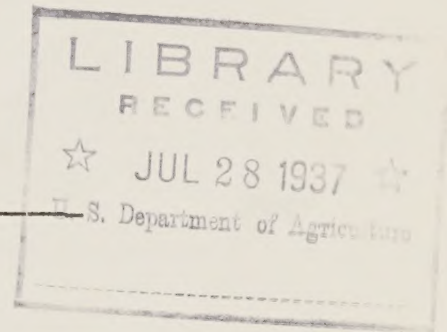
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UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
Division of Plant Disease Control



A REPORT ON THE PROGRESS MADE IN BARBERRY ERADICATION
DURING THE CALENDAR YEAR 1936
INCLUDING SUMMARIZED RESULTS FOR THE PERIOD 1918-1936

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BARBERRY ERADICATION

Calendar Year 1936

When conditions are normal for the development of small-grain crops, the 17 States participating in the barberry eradication program harvest annually about $1\frac{1}{2}$ billion bushels of wheat, oats, barley, and rye, valued at approximately one billion dollars. This represents 75 percent of the total production of these four crops in the entire United States. Naturally, any factor which may seriously affect both the quality and per acre yield of small grains within this area is of national economic importance.

Stem rust is recognized in every important grain-growing country of the world as one of the most destructive of all diseases that attack small grains. During the past 20 years it has caused annual losses in the barberry eradication area averaging more than 27 million dollars. During certain seasons, such as 1916 and 1935, when weather conditions particularly favored the development and spread of the fungus, damage in a single year has exceeded 100 million dollars.

There are two important sources of stem rust inoculum in the northern part of the United States, (1) the remaining rust-susceptible barberry bushes, and (2) rusted grain fields in Texas and Mexico, where the summer stage of the disease survives throughout the year. The relative importance of these sources varies from year to year, depending upon weather and other crop conditions. Local barberry bushes, however, are a much more direct source of inoculum and usually are found to be responsible for the first rust that appears in the spring. Only occasionally during the past 25 years, when crops in the spring-wheat States were abnormally late and weather conditions favored the northward movement of rust, has stem rust spreading from the South become epidemic over extensive areas before the crops matured.

Although the common barberry is not native to the United States, it was introduced by some of America's earliest settlers. From the few bushes that were planted along the New England Coast, it spread rapidly as the result of birds scattering seeds to stream banks, fence rows, and other uncultivated lands. By 1700, farmers began to complain that their grains were blasted when grown near barberries and in 1726 Connecticut enacted the first legislation in the United States requiring the eradication of these bushes. Not until 1918, however, was an organized eradication movement begun. By that time barberry bushes had become generally distributed over the Great Plains area and the control of stem rust was recognized as a regional or national problem. Since then the 13 States of Colorado, Illinois, Indiana, Iowa, Michigan, Minnesota, Montana, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin, and Wyoming, have continued a systematic eradication program

in cooperation with the United States Department of Agriculture. The stem rust control work is administered by the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, in cooperation with the State Departments of Agriculture, State colleges of agriculture, and independent organizations within the participating States.

Recommended measures for the control of stem rust include (1) eradicating rust-susceptible barberry bushes in important grain-growing States, (2) selecting for seed the more rust-resisting varieties of grain that are otherwise adapted to the area, and (3) planting spring grains early on well-prepared soil. There follows a brief discussion of the progress that has been made in barberry eradication during the calendar year 1936, including brief statements relative to accomplishments since the work was first undertaken in 1918.

SURVEY AND ERADICATION

Progress.--During 1936, 68,500,000 barberry bushes were destroyed on 11,000 properties in the 17 States participating in the stem rust control program. A careful inspection was made of all native and planted shrubbery on 72,000 square miles in 315 counties.

Since the beginning of the barberry eradication program in 1918, nearly 23 million bushes have been destroyed in the 13 States that comprise the original control area, and as a result of similar work conducted with emergency funds in Missouri, Pennsylvania, Virginia, and West Virginia since 1935, an additional 83 million bushes have been destroyed, bringing the total number eradicated in the important grain-growing areas of the United States to more than 106 million.

In the following tables there are compiled, by States, data relating to the progress that has been made in the control work. It should be pointed out, however, that the figures in Virginia, West Virginia, and Colorado, are hardly comparable with those in other States of the area, as this work has been largely in areas where native species of barberry are prevalent. In the Virginias, Berberis canadensis is being eradicated in the important grain-growing communities, while in Colorado much of the work during the past three years has been in the southwestern part of the State where B. fendleri is prevalent. These native species grow in patches often several rods in diameter, which accounts for the relatively large numbers of bushes destroyed in recent years.

State	Sq. mi. covered	Proper- ties cleared	Bushes 1/ destroyed 1936	Chemicals used		
				Salt (tons)	Atlacide (lbs.)	Kerosene & oil (gal.)
Colo.	452	72	2/ 1,657,038	23.0	5,000	0
Ill.	7,305	954	11,570	28.6	0	25
Ind.	5,944	447	17,844	15.3	0	56
Iowa	7,367	729	15,993	79.3	0	235
Mich.	12,494	1,405	201,234	247.0	0	175
Minn.	5,357	611	10,629	53.3	0	0
Mont.	-	48	664	1.3	0	0
Nebr.	8,250	129	660	3.8	0	3
N. Dak.	-	27	4,165	1.4	0	0
Ohio	9,288	1,098	244,017	143.9	0	0
S. Dak.	1,370	11	51	.3	0	0
Wis.	5,301	680	33,968	44.8	0	0
Wyo.	162	0	8	0	0	0
	63,290	6,211	2,197,841	642.0	5,000	494
Mo.	6,728	785	8,804	4.7	0	0
Pa.	1,775	2,561	2,788,690	1,049.0	0	0
Va.	417	1,223	3/ 44,961,117	997.0	0	161
W. Va.	309	785	3/ 18,594,675	1,239.0	6,000	88
	9,229	5,354	66,353,286	3,289.7	6,000	249
Total						
17 States	72,519	11,565	68,551,127	3,931.7	11,000	743

1/ Includes sprouting bushes and seedlings

2/ Includes Berberis fendleri

3/ Berberis canadensis in Virginia and West Virginia.

As in the past, salt was the principal chemical used for eradication purposes. Chlorates were employed to some extent, particularly for treating native barberries in Colorado, Virginia, and West Virginia. Fuel oils and salt brine were tried experimentally but a further check of results is necessary before a definite statement can be made as to the relative effectiveness of these materials. Bushes were dug or grubbed only when the application of a chemical might be injurious to nearby shrubs or trees. During the year a total of 3,931 tons of salt and 11,000 pounds of atlacide were used.

Selection of territory.—In order to make the best possible use of funds provided for the eradication of barberry bushes, areas to receive the attention of survey crews were selected after taking into consideration the following points: (1) Requests for assistance in stem rust control received from individual grain growers, groups of farmers, county agents, and others interested in agricultural problems; (2) rust data accumulated during past years, particularly in-

Data showing, by States, the number of properties cleared, and the number of barberry bushes and seedlings destroyed, April 1918 to December 31, 1936

State	Number of new properties cleared of bushes			Number of bushes and seedlings destroyed		
	In cities and towns	Having escaped bushes	Total	Total in cities and country	Dug	Treated
Colorado	1,688	388	553	2,241	2,061,837	439,792
Illinois	12,672	3,344	5,848	18,520	712,410	1,990,004
Indiana	4,186	951	2,191	6,377	125,757	164,318
Iowa	7,969	3,237	5,713	13,682	858,251	364,785
Michigan	6,420	5,000	9,222	15,642	2,018,055	4,279,524
Minnesota	3,439	2,544	4,251	7,690	858,939	112,648
Montana	262	174	289	551	35,797	8,057
Nebraska	3,365	390	1,245	4,610	112,469	32,724
North Dakota	588	48	448	1,036	25,723	10,198
Ohio	9,424	3,518	6,492	15,916	466,670	2,653,728
South Dakota	580	291	886	1,466	112,389	23,472
Wisconsin	7,852	5,096	7,299	15,151	3,612,819	1,803,982
Wyoming	86	5	33	119	5,034	484
13 States	58,531	24,986	44,470	103,001	11,006,150	11,883,716
Missouri	762	102	273	1,035	10,002	5,463
Pennsylvania	660	2,090	2,350	3,010	210,211	2,640,704
Virginia	0	1,530	1,530	1,530	244,403	58,970,466
West Virginia	5	892	895	900	4,631,921	16,950,467
4 States	1,427	4,614	5,048	6,475	5,156,537	78,567,100
Total	59,958	29,600	49,518	109,476	16,162,687	90,450,816
17 States						106,613,503

formation relating to local epidemics; (3) reports of barberry plantings received from school children, property owners, and others; (4) records of known areas of infestation; and (5) proximity of infested areas to important small-grain-growing communities. In a few instances it was found necessary to consider the availability of laborers when selecting territory to be given attention.

Methods.--During the past year work was conducted largely with crews made up of laborers obtained through local reemployment offices. After a brief training period these men were assigned to field work under the direction of an experienced supervisor. Each survey unit was composed of 5 to 10 men and each supervisor was responsible for 3 to 5 crews.

The survey procedure varied with the type of territory in which work was conducted. In counties where a high percentage of the land was under cultivation the fence rows, woodlots, and all planted shrubbery were carefully inspected. In wooded areas, including bluffs along rivers and streams, a single foreman directed as many as 10 to 12 men in a single crew. Under such conditions, eradication work was usually begun in known areas of infestation to permit the men to become acquainted with the identifying characteristics of the bush, and the strip-scouting method of survey was continued until all territory within two miles of the last bush found had been carefully inspected.

RUST OBSERVATIONS AND NURSERY INSPECTION

Stem rust in 1936.--Epidemiology studies made in 1936 indicate that stem rust caused relatively little damage for two principal reasons: The uredial stage of rust was not very abundant in the spring in Texas and Oklahoma; and, although barberries rusted heavily in many portions of the barberry eradication area, the abnormally dry weather caused premature ripening of the crops, thus preventing extensive development of the fungus on grains.

Observations in the fall and winter confirmed previous tentative conclusions that the uredial stage of rust usually becomes established and overwinters more abundantly in the earlier sown fields in Texas and northern Mexico, and occasionally in Oklahoma and Arkansas. Because of dry weather in southern Texas in the fall of 1935, wheat was sown late and did not become generally infected with rust. In northern Texas, rust that overwintered in a few early sown fields developed rapidly in the spring of 1936, causing considerable damage in limited areas. While the rainfall in May was above average at certain points

in northern Texas, there was no repetition of the epidemic conditions of 1935, primarily because of a lack of inoculum, generally distributed early in the season, which permitted most fields to ripen before serious damage occurred. That spores were blown northward in late May is indicated by the presence of early infection centers in Oklahoma and Kansas. Except in low places and late fields, however, the rust did not cause appreciable losses. In northeastern Kansas there was damage in late fields, but the development of the disease in the western part of the State and in most of Nebraska was greatly retarded by the drought.

In general, far fewer spores were carried long distances by the wind than in 1935, as shown by examination of spore traps exposed at various points throughout the barberry eradication area.

While there was a tremendous amount of rust on barberries in many States, the attack sometimes being so heavy as to practically defoliate the bushes, local epidemics of rust on grain were restricted largely to States east of the Mississippi River, where moisture was more abundant. Drought and high temperatures in the upper Mississippi River Valley prevented the development of widespread epidemics. Had the weather been normal, however, it is probable that heavy damage would have resulted in many local areas.

The dangerous role of barberries in the production and perpetuation of parasitic races of stem rust (Puccinia graminis tritici) is apparent from the following information obtained in 1936. From 151 collections of aecial material on barberry, and uredial material in the immediate proximity of barberry bushes, 204 cultures were identified, comprising 24 different races, the ratio of races to collections being about 1:6. From 645 collections of uredial material collected away from barberries, 832 cultures were identified. These comprised 14 races, the ratio of races to collections being about 1:46. Several races obtained from barberry are much more virulent on certain varieties of wheat than those obtained away from barberry. There is also further evidence that one of the races of rust most prevalent during recent years originated on barberry bushes within the past ten years.

Further studies were made of factors affecting germination of barberry seeds, with a view to obtaining information basic to eradication practices.

Susceptibility tests.--During 1936, further investigations were conducted to determine the susceptibility of certain species and varieties of barberry advertised in catalogs and trade journals. Those found highly resistant when tested under natural conditions at Bell,

Maryland, were given further study under controlled (greenhouse) conditions in St. Paul. More than 150 different species and varieties of Berberis have been brought together in the experimental plots at the Foreign Plant Introduction Garden at Bell, Maryland, and others are being added as they are encountered in connection with the nursery-inspection work or advertised by horticulturists.

Inoculations made during the past year have proved that the following species are definitely susceptible to attack by stem rust: Berberis henryana, B. tischleri, B. actinacantha, B. bullata, B. chitria, B. concolor, B. consimilis, B. coralliana, B. dasystachya, B. farrerii, B. hybrids "Carmine", "Comet", and "Coral", B. macracantha, B. poiretii var. weichangensis, B. rehderiana, B. rubrostilla, B. vulgaris a flore gracile, and B. wilsonae stapfiana.

When certain species of barberry are found to be highly resistant to the disease, seedlings grown from seed produced on the resistant bushes are tested as a further precaution against releasing, for interstate shipment, a variety or hybrid which although itself immune, might produce susceptible seedlings.

During the year selected plants belonging to 40 species were inoculated under greenhouse conditions, with the result that three additional species, B. auricoma, B. guimpelii, and B. parvifolia, are now definitely classed as susceptible and 5 species, B. convulvulia, B. dictyota, B. gracilis, B. sanguinolenta, and B. pinnata, have been determined highly resistant. Further tests will be made, however, before these are released for propagation within the protected area.

Classification and nursery inspection.--The inspection of nurseries in connection with the enforcement of Quarantine no. 38 (revised) is an important part of the cooperative stem rust control program. The object is to prevent, through education and regulations, the interstate and intrastate movement of susceptible species of barberry within the control area. In connection with this work, accurate identification of all barberries encountered by Federal quarantine inspectors, State nursery inspectors, and supervisors in charge of eradication work is extremely important. The taxonomic work is carried on at the Arnold Arboretum, Jamaica Plain, Mass., where the best of facilities are available. As previously indicated, the genus Berberis contains a great many species, varieties, and hybrids and, to further complicate field work, many of the species and varietal names in common use are synonyms.

During 1936 more than 200 Berberis and Mahonia specimens were submitted for identification by field inspectors. In addition, some 200 questionable bushes were identified in the field by the Bureau representative responsible for nursery-inspection work. During the year the key used in classifying barberry specimens was enlarged to include more than 230 species, varieties, and hybrids.

Records show that 22 nurseries applied for permits to ship immune barberries into and between States protected by the Federal quarantine during 1936. Prior to granting this authority, 4,740 acres of nursery stock were inspected, with the result that 137 rust-susceptible barberries were destroyed. Twenty-one nurserymen were authorized to ship immune species of barberry interstate and one nurseryman was given a dealer's permit for the same purpose. In addition to the bushes destroyed in nurseries, the Federal inspectors, in cooperation with State nursery inspectors and State leaders of barberry eradication, removed 950 susceptible barberries from parks, arboretums, and private grounds within the barberry eradication area.

INFORMATIONAL WORK

During recent years there has been a steadily increasing demand for printed circulars and other information relating to the control of stem rust of cereals. In addition to the large number of inquiries received from farmers and business men, many teachers in both rural and urban schools have asked for specimens and materials suitable for classroom study. During 1936 these demands were met insofar as possible by (1) releasing approved magazine articles, (2) giving illustrated talks before school and adult groups, (3) placing demonstrations at seed shows and local fairs, (4) distributing brief circulars in advance of field operations, and (5) carrying on a cooperative educational program with public schools. The twofold purpose of the educational work is to impress upon property owners the importance of keeping their farms free of rust-susceptible barberry bushes once the initial eradication work has been completed, and to encourage the reporting of badly rusted grain fields or areas known to be infested with barberry bushes as a guide to communities in which survey work is urgently needed.

Very little educational work has been done during the past two years other than that essential to the progress of the survey program, as practically the entire time of men holding appointments with the Bureau, who are qualified to do this type of work, has been given to the supervision of labor crews in connection with the emergency employment program.

The following table summarizes results of informational work conducted during the period 1928 to 1936. Many elementary and high schools throughout the North-central part of the United States are now including the study of stem rust as a part of the regular course work in agriculture.

PERSONNEL

Since August 1935 a greatly expanded program in barberry eradication has been conducted with funds appropriated under the Emergency Relief Appropriation Acts of 1935 and 1936. The limited regular allotments received through the Federal and State Departments of Agriculture have provided, in addition to general administration, a centrally located field supervisory office in Minneapolis, Minn., and a State leader and his immediate assistants in each of the States participating in the control work. These people have, in addition to supervising crews of laborers employed with emergency funds, continued (1) the necessary educational work in advance of eradication crews, (2) the annual rust studies, and (3) the classification and nursery inspection work required in connection with the enforcement of the stem rust quarantine.

By arranging with the Minnesota Treasury Accounts Office to handle all vouchers covering emergency expenditures made in connection with the barberry eradication program, it has been possible to standardize fiscal procedure throughout the 17 States. Vouchers prepared in State offices were audited and recorded in our Minneapolis office before being submitted to the Treasury Accounts Office for payment.

There is summarized on the following page, by States, information relating to the number of regular employees and security wage earners employed during the calendar year. Peak employment was reached in June 1936, when 4,183 men were at work.

DISPOSITION OF EMERGENCY FUNDS ALLOTTED DURING THE PERIOD July 22, 1935 to December 31, 1936

The primary purpose of the Emergency Relief Appropriation Acts of 1935 and 1936 was to provide funds for employing people who were in need. In selecting work-relief programs, the Works Progress Administration considered, among other things, the suitability of the proposed project as a public enterprise; the proportion of the

Results of educational work conducted in connection with barberry eradication

July 1, 1928 to December 31, 1936

State	Number of counties completed	Demonstrations given before			Total attendance	Number of properties reported	Number of bushes reported
		Grade schools	All schools	Schools and other organizations			
Colorado	22	757	907	911	27,705	34	306
Illinois	20	2,348	2,485	2,540	57,562	355	464
Indiana	33	1,021	1,699	1,764	134,211	159	795
Iowa	35	4,041	4,761	4,879	477,989	883	82,036
Michigan	25	2,945	3,319	3,379	892,236	798	7,192
Minnesota	35	3,802	4,111	4,622	179,548	565	3,426
Missouri	-	-	-	4	915	-	-
Montana	27	1,971	2,067	2,075	54,314	37	115
Nebraska	24	2,116	2,275	2,321	51,425	102	1,439
North Dakota	22	3,425	3,727	3,749	89,077	27	222
Ohio	8	419	530	552	23,184	121	2,778
South Dakota	18	1,638	1,811	1,890	79,347	42	115
Wisconsin	2	286	300	318	7,527	107	277
Wyoming	9	446	494	505	11,488	10	49
Total	280	25,215	28,486	29,509	2,086,528	3,240	99,214

State	Personnel, December 31, 1936					Total employed on both funds	Maximum No. security wage earners, period June 16 - 30, 1936 1/
	Paid with regular funds		Paid with emergency funds				
	Classi- fied service	Agents (super- visors)	Total	Agents (super- visors)	Security wage earners		
Colorado	2	1	3	2	50	52	121
Illinois	2	2	4	6	120	126	284
Indiana	2	1	3	7	76	83	181
Iowa	2	2	4	4	143	147	290
Michigan	2	2	4	4	54	58	461
Minnesota	10 2/	3	13	16	330	346	409
Missouri	2	0	2	7	77	84	193
Montana	1	1	2	0	23	23	63
Nebraska	2	1	3	4	28	32	185
North Dakota	2	1	3	4	27	31	99
Ohio	2	2	4	14	269	283	359
Pennsylvania	2	0	2	13	198	211	308
South Dakota	2	0	2	0	0	0	47
Virginia	2	0	2	10	397	407	465
West Virginia	2	0	2	8	515	523	338
Wisconsin	2	2	4	6	129	135	366
Wyoming	0	0	0	0	0	0	14
Massachusetts	1	0	1	0	0	0	1
Total	40	18	58	105	2,436	2,541	4,183

1/ During the calendar year 1936, maximum employment--3,925 to 4,183 men--was maintained during the period May 1 to November 15.

2/ Includes 3 cooperative part-time employees.

total allotment that would be used for salaries and wages of people certified for employment; and the location of the proposed project, with respect to communities where large numbers of people were unemployed.

There is summarized below information relating to the disposition of emergency funds allotted by the Works Progress Administration for expenditure in connection with the barberry eradication program during the period July 22, 1935, to December 31, 1936.

Total emergency funds made available for expenditure	\$2,775,500.00
Total man-months of relief employment	41,399.02
Total man-months of employment	44,037.44
Percent of personnel taken from relief rolls	94.01
Percent of total expenditures used for wages of security wage earners	78.64
Percent of total expenditures used for salaries of supervisors	10.34
Percent of total expenditures used for all salaries and wages	88.98
Percent of total expenditures used for materials, supplies, travel, and miscellaneous	11.02
Average man-year cost for entire program	\$740.82
Number of States in which work was conducted	17
Number of counties in which work was conducted	305
Number of square miles of area from which barberry bushes were removed	100,500
Number of properties on which barberry bushes were destroyed	14,895
Number of barberry bushes destroyed	85,998,377

Social and economic value of work performed with emergency funds --The wide fluctuation from year to year in yield and quality of small grains caused by stem rust is generally recognized as one of the greatest hazards faced by farmers who rely largely upon the production of wheat, oats, barley, or rye for their cash income. In many parts of the United States the disease is a limiting factor in the profitable production of these crops, in fact it may completely destroy grain crops over wide areas during the two- to three-week period

just prior to harvest. Widespread destructive epidemics of the disease, such as have occurred at intervals since 1900, are of major economic importance from the standpoint of processors and consumers, as well as farmers.

Emergency relief funds used since July 1935 have put the barberry eradication program 8 to 10 years ahead of what it would have been had no expansion in the control work been authorized. This increased field activity has (1) provided additional insurance against sudden reductions in yield and quality of grain crops caused by outbreaks of the stem rust disease, and (2) provided outdoor employment for an average of 2,764 men during the 17-months period, who otherwise would have been unemployed, thus improving the physical and mental condition of many who had been forced to accept relief because of the scarcity of employment.

The following tables present in tabular form, information pertaining to the disposition that has been made of emergency funds allotted for stem rust control work.

COOPERATION

During 1936, agencies cooperating in the barberry eradication program included State Departments of agriculture, State colleges of agriculture, and independent nonprofit organizations such as the Conference for the Prevention of Grain Rust, with headquarters in Minneapolis, Minn., local and State farm bureau organizations, The Greater North Dakota Association, retail merchants associations, and public school officials. In addition to the organization type of cooperation, there has been a noticeable increase in the number of individual property owners who are taking an active interest in the eradication of bushes in their immediate communities. It is expected that as the program progresses a much larger percentage of these people will assume responsibility for keeping their own properties free from bushes, once the initial control work has been completed.

PRESENT STATUS OF THE BARBERRY ERADICATION PROGRAM

The present status of the barberry eradication program varies widely between States, depending upon the extent to which bushes had spread before control work was undertaken and the type of territory involved. Rainfall and other climatic factors directly affecting the rapidity with which barberry bushes spread are far from constant and the types of territory range from open farming, with few trees and

DISTRIBUTION OF OBLIGATIONS---ALL ALLOTMENTS OF W.P.A. FUNDS

July 22, 1935, to December 31, 1936

State	Security wages relief and nonrelief	Percent of total obliga- tions	Salaries of appointees; superin- tendents	Percent of total obliga- tions	Other expense travel, sup- plies, mater- ials, etc.	Percent of total obliga- tions	Total allotment	Total obligations
Colorado	\$ 80,326.70	78.58	\$ 9,273.50	9.07	\$ 12,638.71	12.35	\$ 104,080.00	\$ 102,303.91
Illinois	193,015.32	81.09	21,722.75	9.13	23,279.71	9.78	238,940.00	238,017.78
Indiana	114,124.18	75.19	22,299.00	14.69	15,354.82	10.12	154,310.00	151,778.00
Iowa	148,816.12	78.89	18,260.00	9.68	21,550.99	11.43	189,808.00	188,627.11
Michigan	219,121.46	77.91	26,623.67	9.47	35,489.26	12.62	285,220.00	281,234.39
Minnesota	256,234.19	81.74	30,156.81	9.62	27,089.71	8.64	326,070.00	313,480.71
Missouri	75,037.83	75.18	12,666.39	12.69	12,110.94	12.13	102,149.00	99,815.16
Montana	26,290.68	77.01	2,957.50	8.66	4,890.01	14.33	34,490.00	34,138.19
Nebraska	81,605.30	78.11	9,970.90	9.54	12,898.68	12.35	106,570.00	104,474.88
N. Dakota	36,242.68	70.99	6,985.05	13.68	7,826.65	15.33	51,630.00	51,054.38
Ohio	239,904.61	82.91	31,888.17	11.02	17,567.17	6.07	293,662.00	289,359.95
Pennsylvania	174,682.31	77.53	20,960.80	9.30	29,684.59	13.17	232,920.00	225,327.70
S. Dakota	15,562.96	66.23	4,995.33	21.26	2,938.37	12.51	25,010.00	23,496.66
Virginia	96,281.04	70.68	16,755.80	12.30	23,192.78	17.02	137,570.00	136,229.62
W. Virginia	154,811.04	78.95	12,099.80	6.17	29,185.37	14.88	204,321.00	196,096.21
Wisconsin	221,654.96	80.14	32,269.15	11.67	22,642.86	8.19	281,550.00	276,566.97
Wyoming	4,255.19	63.79	1,200.00	17.99	1,215.26	18.22	7,200.00	6,670.45
Total	\$2,138,026.57	78.64	\$281,089.62	10.34	\$299,555.88	11.02	\$2,775,500.00	\$2,718,672.07
Percentage								

MAN-YEAR COSTS, BASED ON TOTAL OBLIGATIONS, EMERGENCY FUNDS

July 22, 1935, to December 31, 1936

State	Man-hours relief	Man-hours nonrelief	Total man-hours	Total man-years employment	Percent total employees obtained from relief	Total obligations	Cost per man-year
Colorado	184,736	14,766	199,502	131.22	94.80	\$ 102,303.91	\$ 779.64
Illinois	414,247	39,882	454,129	286.62	93.04	238,017.78	830.43
Indiana	241,413	31,211	272,624	173.43	91.74	151,778.00	875.15
Iowa	338,847	38,131	376,978	253.26	92.11	188,627.11	744.80
Michigan	479,662	44,314	523,976	340.34	93.70	281,234.39	826.33
Minnesota	526,155	52,025	578,180	369.40	93.09	313,480.71	848.62
Missouri	217,700	17,635	235,335	160.84	95.02	99,815.16	620.59
Montana	55,554	3,984	59,538	42.38	95.88	34,138.19	805.53
Nebraska	185,714	19,043	204,757	131.91	92.77	104,474.88	792.02
North Dakota	89,477	9,345	98,822	68.95	94.06	51,054.38	740.46
Ohio	526,983	43,243	570,226	359.97	94.73	289,359.95	803.84
Pennsylvania	357,637	27,672	385,309	252.52	94.93	225,327.70	892.32
South Dakota	44,887	7,016	51,903	32.84	90.63	23,496.66	715.49
Virginia	522,776	29,909	552,685	339.86	95.61	136,229.62	400.84
West Virginia	425,095	16,980	442,075	331.53	97.58	196,096.21	591.49
Wisconsin	504,480	57,588	562,068	386.47	92.24	276,566.97	715.62
Wyoming	11,277	1,524	12,801	8.27	91.92	6,670.45	806.58
Total	5,126,640	454,268	5,580,908	3,669.81	--	2,718,672.07	\$740.82
Percent					94.01%		

shrubs, to heavily wooded, rough uncultivated lands, along some of the larger rivers of the country. For the purpose of analyzing the present status of the program, the States making up the control area are divided into three groups.

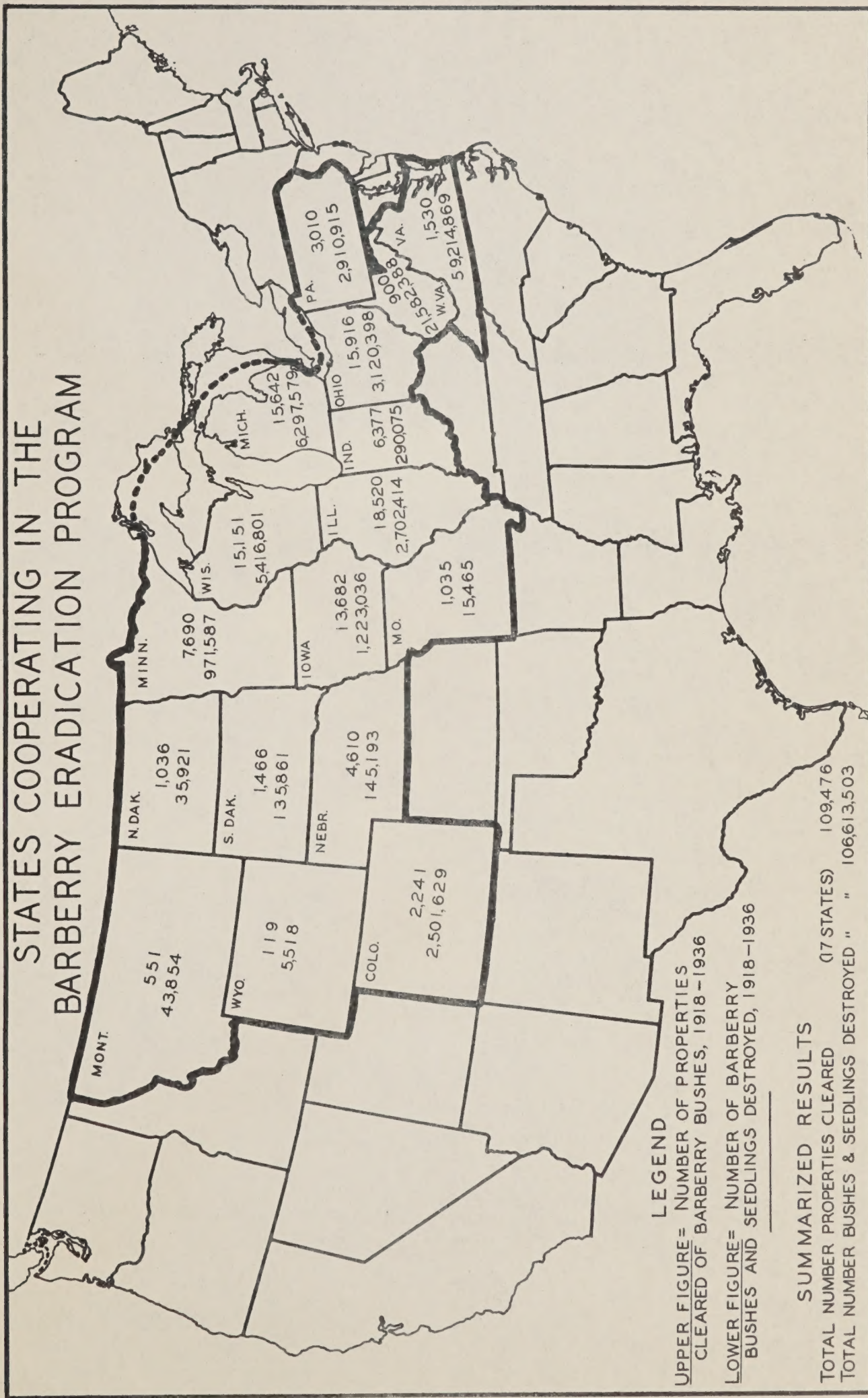
Group I includes Montana, North Dakota, South Dakota, Wyoming, and parts of Colorado and Nebraska. Results of survey work in these States during the past two years indicate that remaining bushes are few and widely scattered. However, past observations show that a single rust-spreading barberry suitably located in an important spring-wheat State may be responsible for a stem rust epidemic resulting in losses over a wide area. Some territory has not been intensively surveyed in these States to date because the evidence at hand does not indicate the presence of rust-susceptible bushes. In order to insure complete eradication, these areas should be worked sufficiently to determine whether or not barberries are present.

Group II includes Illinois, Indiana, Iowa, Minnesota, Missouri, Wisconsin, and parts of Michigan, Ohio, and Nebraska. Barberry bushes originally were plentiful and widely scattered in these States; however, the eradication work in recent years has progressed ahead of the natural increase. Barberry bushes in the immediate vicinity of grain-fields are largely under control. Undoubtedly some new areas of infestation will be found in these States, and considerable clean-up work will be necessary in localities where fruiting bushes were found during recent years.

Group III includes the States of Pennsylvania, Virginia, West Virginia, and parts of Ohio, Michigan, and Colorado, where there is a large survey and eradication problem ahead. Work was started in three of these States with emergency funds in 1935. Results indicate that a considerable amount of labor could be utilized for an indefinite number of years in eradicating the remaining bushes. The present plan is to remove barberry bushes near the grain-growing areas in these States in communities where severe local spreads of stem rust have developed in past years.

Complete eradication over the entire area is made difficult by the fact that new barberry bushes continue to develop as a result of seed scattered by birds and other agencies. Accumulated evidence indicates that seeds may lie dormant, or inactive, for a period of 6 to 10 years before germinating. Thus, areas known to have been infested with fruiting bushes should be given attention at 4- to 5-year intervals until the possibility of new bushes developing from seed is past.

STATES COOPERATING IN THE BARBERRY ERADICATION PROGRAM



LEGEND

UPPER FIGURE= NUMBER OF PROPERTIES
CLEARED OF BARBERRY BUSHES, 1918-1936

LOWER FIGURE= NUMBER OF BARBERRY
BUSHES AND SEEDLINGS DESTROYED, 1918-1936

SUMMARIZED RESULTS

TOTAL NUMBER PROPERTIES CLEARED (17 STATES) 109,476
TOTAL NUMBER BUSHES & SEEDLINGS DESTROYED " " 106,613,503

